SST 903

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DAHL/ C0852W/08 *GB 1384-511

Grooved surface composite threaded nut - has non-threaded hexagonal nut portion pressed onto spigot of other half

NC DAHL 31.01.73-GB-004957 (30.01.68-US-701698)

Q61 (19.02.75) F16b-31/02

The nut is formed to have a yielding section between the groove formed externally by the spigot, so that when a predetermined axial load is placed on the nut the section plastically deforms radially inwards to reduce the groove vol. An elastomeric flowable ring is pref. placed within the spigot groove when the two parts of the nut are joined together. The arrangement avoids the need for separately maching the nut groove. The nut parts may be threaded together as an alternative to pressing them under interference. 31. 1. 73 as 004957 Add to 1240051 (4pp)

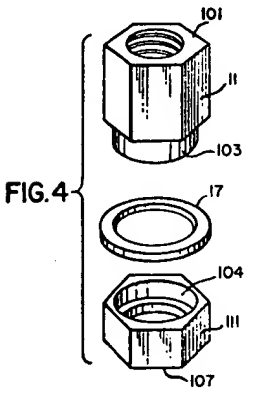

FIG.4

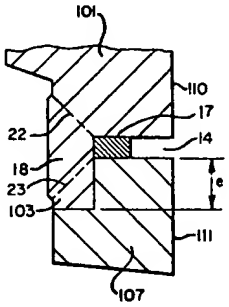

FIG.3

1384511 COMPLETE SPECIFICATION
1 SHEET

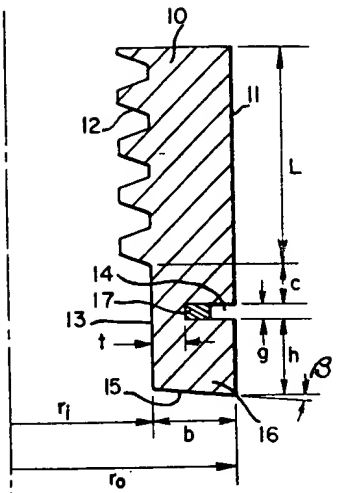

FIG. 1

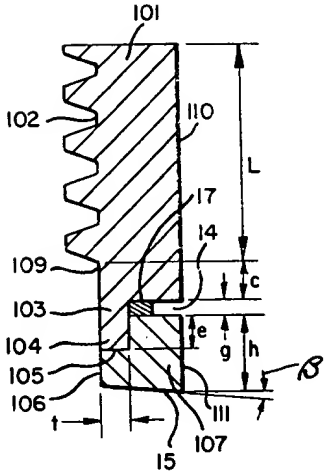

FIG. 2

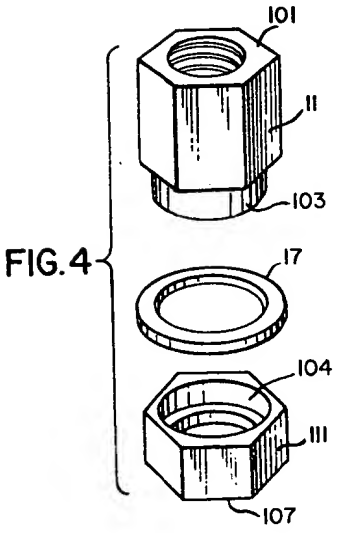

FIG. 4

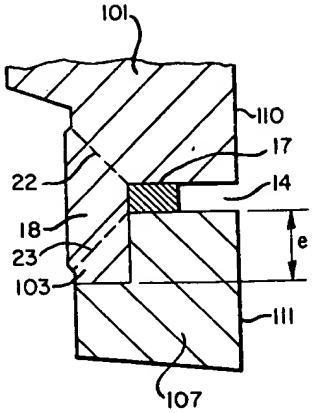

FIG. 3

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F2H 12B4A 13 17B AX6

(54) NUT AND METHOD OF FORMING SAME

(71) I, NORMAN CHRISTIAN DAHL, a citizen of the United States of America, of 78 Irving Place, New York, New York 10003, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a nut intended to indicate when a predetermined design load has been imposed on the nut. In particular the present invention relates to an improvement in the form of a nut disclosed and claimed in British Patent No. 1,240,051 granted to Norman C. Dahl.

The nut described in the said British Patent presently requires in its manufacture a groove in the external surface. This groove is presently formed by a machine tool cutting operation which adds to the cost of manufacture. Therefore, techniques to overcome any cost limitations on this nut design would be most advantageous.

According to one aspect of the present invention there is provided a nut comprising a body formed of two separately formed parts joined together and having a pair of bearing faces; an outer peripheral wall arranged between the said faces; an internal wall having a threaded portion and a non-threaded portion, the non-threaded portion depending from the threaded portion; and an external groove formed on the peripheral wall in a portion thereof which is opposite the non-threaded portion of the inner wall and which is spaced from the pair of bearing faces, the nut having a yielding section disposed between the groove and the internal wall whereby when a predetermined axial load is placed on the nut the yielding section plastically deforms radially inwardly to reduce the volume of the external groove; a first one of said parts having a sleeve-like portion and the second of the part having a stepped internal wall with an enlarged diameter portion acting as a socket formed to receive said sleeve-like portion such that when the sleeve-like portion is fully inserted into said socket the adjacent faces of the two portions at the external wall of the nut body are axially spaced apart to define said groove. A ring of flowable material can be positioned between the two parts so that the material is contained within the external groove when the two parts of the nut are joined together. The invention therefore overcomes the difficulties of manufacturing nuts having grooved surfaces by providing a method of manufacture which eliminates or minimises costly machining operations and thus makes available at low cost nuts of technically effective designs.

According to a further aspect of the present invention there is provided a method of forming the above-defined nut which comprises: forming the first part having a sleeve-like portion extending therefrom, the outer surface of the sleeve-like portion having a smaller cross-section than the outer surface of the remainder of the first part; forming the second part having a socket to receive said sleeve-like portion of the first part; and joining said first and second parts whereby the sleeve-like portion is received within the socket, said first and second parts defining an annular external groove on the outer surface of the assembly of the joined first and second parts, said groove extending radially inward and terminating at the outer surface of the sleeve-like portion whereby a composite nut is formed.

In a preferred embodiment of the method the first part has two sections one of which sections has an outer wrenching surface and a second of which sections is a sleeve-like portion of a lesser diameter than the wrenching surface of the first section, said first part having an inner surface which is threaded along a portion thereof and non-threaded for the remainder of said surface; the second part is formed with an outer wrenching surface and with a non-threaded inner surface and a cylindrical groove disposed within said second part adjacent to said inner surface; and said first and second parts are joined to form a fastening member whereby the sleeve-like portion is received

[Price 33p]

within the groove, the outer surfaces of the parts defining an annular groove on the outer surface of the fastening member, said groove extending radially inward and terminating at the outer surface of the sleeve-like portion.

In order that the present invention may more readily be understood the following description is given, merely by way of example, reference being made to the accompanying drawings in which:—

Figure 1 is a sectional view of the preferred embodiment of prior art designed according to British Patent No. 1,240,051;

Figure 2 is a sectional view illustrating how the nut of Figure 1 is made of two parts according to the present invention;

Figure 3 is an enlarged sectional view of a portion of the nut of Figure 2 after it has undergone plastic deformation; and

Figure 4 is a telescopic exploded perspective view of the preferred embodiment of the invention.

The nut 10 designed according to British Patent No. 1,240,051, and shown in Figure 1, has a hexagonal outer peripheral wrenching surface 11 and an upper internal threaded section 12 of axial length L and a lower internal cylindrical section 13 of radius r_i. At an axial distance c below the internal threaded section 12 the outer peripheral wrenching surface 11 has an external disc-shaped annular groove 14 of width g and inner radius r_i+t. A flowable incompressible material 17 partially fills the groove 14. The internal cylindrical section 13 extends for an axial distance h below the annular groove 14 to form a lower cylindrical section 16 which terminates in the bearing face 15 which is a conical surface of cone angle β. The width g of the groove 14 is generally made some fraction of the radial thickness t of the material between the bottom of the external groove 14 and the cylindrical surface 13.

Figure 2 shows a nut made according to the present invention. The nut has the same overall geometric configuration as the nut of Figure 1 but is made of two parts, an upper part 101 and a lower part 107. The outer surfaces 110 and 111 of the upper and lower parts form a hexagonal outer wrenching surface. The upper part has an internal threaded section 102 and a non-threaded section 109 from which extends a sleeve-like portion 103 of axial length $e+g$. The outer surface of the portion 103 is of a diameter r_i+t, and is clearly smaller in cross-section than the wrenching surface 110.

The lower part 107 has a socket, in this case a cylindrical groove 104, adjacent to the internal cylindrical surface 106 of axial depth e and of such diameter as to receive the sleeve-like portion 103 of the upper part 101. The sleeve 103 of axial length $g+e$ can be fully inserted into the groove 104 of axial length e so that the two parts define an annular groove of width g which extends radially inwardly to the outer surface of the sleeve 103.

Figure 3 shows the mechanism of plastic deformation when the design bolt force is transmitted by the nut of Figure 2. When the design force exists. conical shear regions 22 and 23 develop and a wedge-shaped yielding section 18 deforms radially inward and allows the external groove 14 to decrease in width.

The conical shear regions 22 and 23 develop because the material radially outward of the sleeve 103 is very slowly stressed and provides restraint which prevents the yielding section 18 from moving radially outwardly and this in turn causes the plastic deformation to be such that the conical shear regions develop so that yielding section 18 moves radially inwardly. In order to get the required constraint so that the yielding section moves radially inwardly, it is necessary to make e large enough, as shown in Figure 3, so that the lower conical shear region 23 is contained in the axial extent of the sleeve 103.

To assemble the nut, the two parts 101 and 107 as shown having been separately formed such as by forging, are pressed together to bear against each other on the line 105 and form a composite nut as shown in Figure 2. Although in the preferred embodiment the separate parts 101, 107 are forged, it is to be understood that the nut parts may be formed by other methods, such as casting. Further, the two parts can be assembled by processes other than pressing.

As described in the above-referenced British Patent, the external groove 14 may be filled with an incompressible flowable material 17 which may or may not be electrically conducting in order that a visual indication may be provided when the groove is reduced in width and the material extrudes from the groove. In Figure 4 a flowable material 17 in the form of an annular ring is positioned between the two parts so that the material is disposed in the external groove once the nut has been assembled. The annular ring 17 may comprise a soft metal, such as aluminium, copper or brass.

By forming separate parts of the nut and then assembling the parts to form the composite nut, it is possible to eliminate the high machining costs which arise when the nut is formed from one piece. Although described with reference to forming a nut from two parts, the nut may of course be formed from more than two parts. Further, the threaded part may have the socket

104 and the non-threaded part the sleeve-like portion 103.

WHAT WE CLAIM IS:—

1. A nut comprising a body formed of two separately formed parts joined together and having a pair of bearing faces; an outer peripheral wall arranged between the said faces; an internal wall having a threaded portion and a non-threaded portion, the non-threaded portion depending from the threaded portion; and an external groove formed on the peripheral wall in a portion thereof which is opposite the non-threaded portion of the inner wall and which is spaced from the pair of bearing faces, the nut having a yielding section disposed between the groove and the internal wall whereby when a predetermined axial load is placed on the nut the yielding section plastically deforms radially inwardly to reduce the volume of the external groove; a first one of said parts having a sleeve-like portion, and the second of the parts having a stepped internal wall with an enlarged diameter portion acting as a socket formed to receive said sleeve-like portion such that when the sleeve-like portion is fully inserted into said socket the adjacent faces of the two parts at the external wall of the nut body are axially spaced apart to define said groove.

2. A nut according to claim 1, wherein the said threaded portion of the internal wall of the nut is formed on the said first part.

3. A nut according to claim 2, wherein said first nut part also carries at least a part of said non-threaded internal wall portion.

4. A nut according to claim 1, 2 or 3, wherein said first and second parts are made by forging.

5. A nut according to any one of claims 1 to 4, and including a non-compressible flowable material in said groove.

6. A nut according to any one of claims 1 to 5, wherein said first and second parts both have a wrenching surface defined on their outer peripheral surfaces.

7. A nut constructed substantially as hereinbefore described with reference to and as illustrated in Figures 2 to 4 of the accompanying drawings.

8. A method of forming the nut of claim 1 which comprises forming the first part having a sleeve-like portion extending therefrom, the outer surface of the sleeve-like portion having a smaller cross-section than the outer surface of the remainder of the first part; forming the second part having a socket to receive said sleeve-like portion of the first part; and joining said first and second parts whereby the sleeve-like portion is received within the socket, said first and second parts defining an annular external groove on the outer surface of the assembly of the joined first and second parts, said groove extending radially inward and terminating at the outer surface of the sleeve-like portion whereby a composite nut is formed.

9. A method according to claim 8, wherein the said first and second parts are made by forging.

10. A method according to claim 8 or 9, which includes joining said parts by pressing together said parts to form the fastening member.

11. A method according to claim 8, 9 or 10, and including forming an internally threaded surface within said first part.

12. A method according to any one of claims 8 to 11 and including forming a non-threaded inner surface within said second part.

13. A method according to any one of claims 8 to 12, and including inserting a ring of flowable incompressible material between said parts prior to joining the first and second parts whereby when the first and second parts are joined the ring-like material is disposed in the annular external groove.

14. A method according to any one of claims 8 to 13, wherein the sleeve-like portion is given a smooth inner surface and the remainder of the first part is given a threaded inner surface.

15. A method according to any one of claims 8 to 14, wherein the socket in the second part is an internal cylindrical socket.

16. A method of forming a nut, such method being substantially as hereinbefore described with reference to Figures 2 to 4 of the accompanying drawings.

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